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ABSTRACT

This study was conducted to determine the generality of the automatic encoding phenomenon. It was hypothesized that elaborative facilitation of paired associate learning would be induced by mere inspection of conjoined referents without instructions to remember. Subjects were 120 kindergarten and 120 second grade children who were tested individually by a study-test paired associate procedure. The design consisted of a 2x2x2x5 factorial with grade level, pictorial depiction (separated versus conjoined), list (two lists, each with 14 TBR noun referent pairs) and instructions as factors. One memory instruction and four incidental learning conditions were used. The incidental learning conditions differed in terms of the nature of the orienting task subjects were required to perform. Consistent with the automatic encoding hypothesis, the results revealed substantial elaborative facilitation within each of the different incidental learning conditions. (Author/MS)

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Automatic Elaborative Encoding in Children's Pictorial Learning[1,2,3]

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[3]A paper presented at the bienniel meeting of the Society for Research in Child Development, March 17-20, 1977, New Orleans, Louisiana.

Abstract

A study by Kee & White (in press) revealed that conjoined referent presentation facilitates paired-associate learning relative to separated referent presentation regardless of whether or not the subject is given memory instructions. This outcome is consistent with the automatic encoding hypothesis which proposes that the inspection of referents under conjunction is sufficient to induce elaborative encoding of the TBR pair members. The present study was conducted to determine the generality of the automatic encoding phenomenon. The design consisted of a 2 x 2 x 2 x 5 factorial with grade (kindergarten versus second), pictorial depiction (separated versus conjoined), list (two lists, each with 14 TBR noun referent pairs), and instructions. One memory instruction and four incidental learning conditions were used. The incidental learning conditions differed in terms of the nature of the orienting task subjects were required to perform. One hundred-twenty subjects at each grade level were tested individually by a study-test paired-associate procedure. Consistent with the automatic encoding hypothesis, the results revealed substantial elaborative facilitation within each of the different incidental learning conditions.

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Elaboration is a coding strategy which consists of establishing common referential meaning for otherwise disparate items (cf. Rohwer, 1973). Research in paired-associate learning indicates that young children are production deficient in elaboration but that these children can be prompted to elaborate by presenting the referents of the TBR pair conjoined in a spatial interaction; for example, a picture of a chain coiled up inside a bowl. This conjoined depiction is usually compared to the presentation of the referents side by side; for example, a picture of a chain next to a bowl. The usual result is that conjoined presentation is associated with improved performance relative to separated presentation (Kee, 1976).

Two hypotheses have been advanced to account for the manner in which conjoined referents induce elaboration. The first is the automatic encoding hypothesis, which proposes that conjoined referents orient the subject to analyze the shared relational attributes of the TBR pair, which induces the encoding of common referential meaning for the pair members. This hypothesis holds that the inspection of conjoined referents is a sufficient condition for facilitation. The alternate hypothesis places principal emphasis on memory instruction. It proposes that instructions to remember prompt the subject to process the shared relationship between conjoined referents. This

latter hypothesis holds that memory instruction is a necessary condition for facilitation.

Research by Kee & White (in press), consistent with the automatic encoding hypothesis, indicates that conjoined referent presentation facilitates performance in the absence of direct instructions to remember. Furthermore, such instructions enhance separated referent acquisition but not conjoined referent acquisition. Although these findings suggest that the mere inspection of conjoined referents induces elaborative coding, such a characterization may be premature. Limitations can be identified in the Kee & White study which place into question the appropriateness of the incidental condition used to assess automatic encoding and the generality of their results.

One limitation is that the incidental condition used was not pure. That is, subjects were asked to inspect a series of referent pairs under the pretense that their opinions regarding the artwork would be later solicited. Such a disguise was used to maintain the credibility of the incidental condition, however, it may have prompted differential processing of the TBR pairs in the two conditions used. Thus, in the present study, provisions were made to provide a more decisive assessment of automatic encoding by assessing conjoined referent facilitation under an inspection condition in which the subjects were merely asked to inspect the series of referent pairs, nothing more or less.

Another limitation is the generality of the previous automatic encoding results, because facilitation with conjoined referent presentation was only assessed under one incidental task condition. In addition to the pure inspection condition just discussed, two more incidental conditions were included in the present study. The design of these was influenced by the

levels of processing framework suggested by Craik and Lockhart (1972). One of these conditions required subjects to make a well defined orienting response to the structural features of each referent within the TBR pair, while the other required subjects to reference the shared semantic meaning of the TBR pairs. It was predicted that the structural orienting task condition would produce a level of performance similar to the standard memory control used in the study, while the semantic orienting task condition would facilitate performance relative to this memory control. Both of these predictions are based on the notion that young children are production deficient in semantic processing skills (cf. Geis, 1976).

METHOD

Design and Materials. A 2 x 2 x 2 x 5 factorial with grade level (kindergarten versus second), pictorial depiction (separated versus conjoined), list (two lists, each with 14 noun pairs), and instruction (four types of incidental learning conditions and a memory condition) was used.

The materials for the study consisted of 28 pairs of common objects which had been used previously by Kee & White. The 28 pairs were randomly divided into two lists. Black on white line drawings of the object pairs were mounted on 12.7 x 17.8 cm cards and presented to subjects manually.

Subjects. One hundred-twenty kindergarten children (60 boys and 60 girls) with a mean age of 5.88 years (range 5.33 to 7.00) and 120 second grade children (55 boys and 65 girls) with a mean age of 7.97 years (range 7.25 to 10.08) participated in the study. Subjects were drawn from three public elementary schools located in a middle class suburb of Los Angeles, California. Subjects within each grade level were randomly assigned in equal numbers to one of ten experimental conditions.

Procedure. A study-test paired-associate method was used. Subjects were tested individually in a quiet room at the participating schools. Two examples were given to familiarize subjects with the procedure. Instructions given to a subject differed according to the instructional condition. The five instructional conditions were:

1. Memory: The subject was told to learn each pair in such a way so that he could produce the name of one pair member when presented with the other on a subsequent memory test. The experimenter verbally labeled each referent.

2. Kee & White Inspection: The subject was told to inspect the pairs carefully and was led to believe that his opinions regarding the drawings would be sought subsequent to the presentation trial. The experimenter verbally labeled each referent. This condition, in combination with the memory condition, permitted a replication of the Kee & White study.

3. Pure Inspection: The subject was told to inspect each noun referent pair. The experimenter verbally labeled each referent. This condition was designed to provide a more decisive assessment of automatic encoding than the Kee & White inspection condition by asking the subject to merely look at the pairs.

4. Structural Orienting Task: The subject was told to express his like or dislike for the way each referent within the pair was drawn. He was asked, "Do you like the way the (name of object on the left) is drawn?" and "Do you like the way the (name of object on the right) is drawn?" This condition was designed to be antagonistic to elaborative coding by requiring the subjects to analyze each member of the pair separately.

5. Semantic Orienting Task: The subject answered two questions with regards to seeing each referent pair together at the same time and the same place.

"Have you ever seen a (name of object on the left) and a (name of object on the right) together before?" and "Do you think you will ever see them together (again)?" This condition was designed to orient subjects towards referencing the shared semantic meaning of each pair.

The referent pairs were presented at a ten second rate on the study trial. After presentation, instructions and two examples for the test trial were given. On the test trial, the subject was presented with one member of each pair and was given six seconds to verbally recall the associate.

At the conclusion of the test trial, subjects in the four incidental learning conditions were asked if they had expected the memory test. Eighteen subjects who had anticipated the test were replaced.

RESULTS

The dependent variable selected for analysis was the total number of correct responses given on the test trial. A lenient scoring criterion was used such that synonyms of the experimenter provided labels were also accepted as correct. The type I error rate was set equal to .05.

The factor of list was only associated with one source of significant effect; a depiction x list interaction, $F(1,200) = 4.97$. This interaction, however, did not serve to alter conclusions drawn about the pattern of effects associated with the factors of depiction, instruction, or their interaction. Thus, the means in Table I are presented collapsed over the factor of list.

Insert Table I about here

A main effect of depiction was observed, $F(1,200) = 107.48$, indicating that conjoined referent presentation facilitated performance relative to separated referent presentation. This outcome was not qualified by any higher order interactions. The absence of the crucial depiction x instruction interaction indicates that conjoined referent facilitation is general across the instructional conditions in this study. Inspection of the means of Table I provides visual confirmation of this. This finding is consonant with the automatic elaborative encoding hypothesis which suggests that the mere inspection of conjoined referents is sufficient to prompt efficient encoding.

A main effect of instruction and an interaction between the factors of grade x instruction were observed, $F(1,200) = 15.58$ and $F(1,200) = 3.99$, respectively. Post hoc comparisons between instructional conditions within each grade level revealed that for the second graders, the semantic orienting task condition facilitated performance relative to the other four instructional conditions which did not differ from each other. In the kindergarten level, the semantic orienting task condition only facilitated performance relative to the Kee & White inspection and the structural orienting task conditions. No other significant source of variance was detected.

The data were analyzed for the occurrence of interlist and extralist intrusions. Interlist intrusions are defined as items within the list that are given as responses to an incorrect stimulus item on the test trial, while extralist intrusions are words that are not items in the list which are given as responses on the test trial. Analysis of variance revealed only two significant effects. A main effect of grade level for interlist intrusions indicated that second grade children ($M = 1.91$) made more interlist intrusions

than did the kindergarten grade children (M = 1.65), $F(1,200) = 5.46$. This outcome suggests that second grade children may have a greater propensity to guess on test trials when they do not know the correct associate relative to kindergarten children. A main effect of depiction for interlist intrusions was also observed, $F(1,200) = 16.05$, indicating that more intrusions were associated with separated (M = 1.82) than conjoined (M = 1.03) depiction. This latter outcome is consistent with the notion that a more cohesive memory trace is established for pairs under elaboration.

DISCUSSION

The finding of conjoined referent facilitation in the pure inspection condition is consistent with the automatic encoding hypothesis which holds that the mere inspection of referent pairs is sufficient for inducing elaborative coding. This outcome is general to the other incidental conditions used in the study. The structural orienting task was designed to minimize relational encoding by prompting analysis of the physical features of each item in the pairs. The demonstration of conjoined referent facilitation in this condition indicates that shared referential meaning can be automatically encoded despite antagonistic processing by the subject. Conjoined referent facilitation was enhanced by the semantic orienting task, which suggests that while mere inspection of referent pairs is sufficient for automatic elaborative coding, the strength of the elaborative trace can be augmented by active semantic processing.

Kee & White (in press) observed that separated referent performance was improved by memory instruction. This facilitation was not observed in the present study. A minor methodological variation between the two studies may account for this discrepancy. Kee & White presented pairs at a four

second rate for two consecutive study trials prior to the memory test, while in the present study, subjects were allowed only one study trial with a ten second per pair presentation rate. The two trial method with the shorter pair presentation rate may be better suited to engage and maintain the attention of young children than the one trial method, thereby increasing the probability of rehearsal under memory instruction.

A final point concerns the pattern of instructional effects observed. Craik & Lockhart (1972) have suggested that the memory trace is a positive function of the depth to which the stimulus has been analyzed. Stimuli analyzed semantically are processed to a deeper level than stimuli analyzed in terms of structural characteristics. The results of this study are consistent with this proposition. Performance in the semantic orienting task condition was superior to performance in the structural orienting task condition. Furthermore, no difference was observed between the structural orienting task condition and the memory control. This latter finding is consistent with the notion that young children do not spontaneously engage in relational processing under memory instructions. The absence of facilitation at the kindergarten level (i.e., between the semantic orienting task condition and the memory condition) suggests that the orienting task was not explicit enough to induce the semantic analysis required for elaborative coding. Ample research indicates that a more explicit instructional device, for example, interactive imagery instruction, would have produced facilitation (Levin, 1972).

In summary, elaborative facilitation was demonstrated in the absence of direct instructions to remember. This finding is consistent with the automatic encoding hypothesis which holds that the mere inspection of

conjoined referents is sufficient to induce elaboration, hence test performance facilitation.

Table I

Mean Number of Correct Responses as a Function of

Grade, Referent Depiction, and Instructional Condition

Grade	Instructions: Memory	Kee & White Inspection	Pure Inspection	Structural Orienting Task	Semantic Orienting Task	M
Kindergarten						
Separated	2.83	1.67	3.00	1.50	4.17	2.63
Conjoined	5.83	5.92	5.58	4.25	6.67	5.65
M	4.33	3.79	4.29	2.88	5.42	
Second						
Separated	2.50	2.83	0.92	0.75	6.75	2.75
Conjoined	6.33	6.50	5.83	5.25	10.42	6.87
M	4.42	4.67	3.38	3.00	8.58	

MS_e (200) = 7.10

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